it would not be permanent. But experiments show that if the training is continued for a few days with the instrument, the gain will be transferred to the ordinary singing without the instrument. This is the most encouraging feature in the process and deserves to be analyzed in great detail for the purpose of a pedagogy of singing; this we are now attempting to do in the laboratory. Such questions as these arise: How is association transferred from the visual to the auditory-motor? What are the common elements in visual and auditory control? How can we isolate each of these factors for the purpose of reduction of error?

This type of training is convenient, inexpensive and rigid. The pupil may be assigned any one of a hundred exercises in pitch training and practise all by himself under correction at every tone production; it may be to reduce a tendency to sharp or flat, to eradicate a tremulo, to gain control of a vibrato, or any other pitch figure the master may set. It gives opportunity for control drill under the severest correction at every stage.

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ORVILLE A. DERBY

IN November last the newspapers published a cablegram from Rio de Janeiro announcing the suicide of Orville A. Derby, director of the Brazilian Geological Survey. Letters from mutual friends have now thrown all the light on the subject that we can reasonably expect to get.

Mr. Derby first went to Brazil in 1870 as student assistant of Charles Fred Hartt, who was then professor of geology at Cornell University. He made two other vacation trips to that country, and went to Brazil finally in 1875 to be assistant geologist to the newly established geological survey of the Empire, and lived there the rest of his life. In 1877 the survey was suspended, and Professor Hartt, its director, died at Rio. Mr. Derby was shortly thereafter appointed curator of geology in the National Museum at Rio, and held that position until 1886 when he was put in charge of a newly established geological survey of the state of S. Paulo, a position he held until 1904. In 1907 a new federal survey was provided for under Dr. Miguel Calmon, minister of public works, with Derby as its chief.

The war in Europe disturbed the financial equilibrium of South American countries as well as that of other parts of the world. Brazil was probably obliged to economize wherever it was possible to do so, and this led to the reduction of appropriations for the work of the geological survey to such a point as to destroy the efficiency, and even to threaten the existence of that organization. Probably the necessity for such economies was not apparent to Mr. Derby, and he looked upon them as an attempt to discredit him and the bureau under his direction. In any case he took the matter very much to heart, and his friends find no other reason, or shadow of a reason, for his suicide.

Mr. Derby never married, and he led the solitary life of a recluse and student. He was held in the highest esteem by all who knew him. His whole life was given to the study of the geology of Brazil, and no one, living or dead, knew it as he did, or was more profoundly or more unselfishly interested in it. At the time of his death he had published more than a hundred and twenty-five papers on the geology of Brazil, many of them in the Portuguese language, which he wrote with ease.

His successor as the director of the geological survey of Brazil is Dr. L. F. Gonzaga de Campos, one of the ablest and most trustworthy of the Brazilian geologists, and for many years one of Mr. Derby's most competent assistants.

A fuller account of his life and work will be published in the *Bulletin* of the Geological Society of America.

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PARIS-WASHINGTON LONGITUDE[1]

DIRECTOR B. BAILLAUD, of the Paris Observatory, presented the results of the determina-

[1] Translation from *Comptes Rendus de l'Academie des Sciences*, February 14, 1916.

tion of the difference of longitude between the observatories of Paris and Washington, as deduced under the direction of M. Renau, who makes the following statement:

It is now three fourths of a century since the first attempts were made to connect Europe and America in longitude. Gilliss in 1838, by meridian observations of the moon, and later Walker, Peirce, and others, by means of eclipses and occultations, obtained results which were not accordant and showed a range of 2.5 seconds.

About 1849 new determinations were made with the aid of chronometers, but these gave results of little greater precision. Since 1866, several determinations were made by the exchange of telegraphic signals. Gould in 1866, Dean in 1870 and Hilgard in 1872 determined the difference between Cambridge and Greenwich. Hilgard in 1872 determined the difference between Cambridge and Paris, and in 1892 a determination was made between Montreal and Greenwich.

In 1912 Captain Jayne, superintendent of the Naval Observatory, with the approval of the Acting Secretary of the Navy, proposed that a determination be made of the difference of longitude between the observatories of Paris and Washington.

Early in 1913 the Bureau of Longitudes began to study the conditions under which this important work could be undertaken. For some years Messrs. Claude, Driencourt and Ferrié, had been developing the idea of applying radio signals to the determination of the differences of longitude, and due to their remarkable initiative the observatory had been able to successfully measure the differences between Paris–Bizerta, and Paris–Uccle, in 1911 and 1912.

These previous operations seemed to fix the most suitable methods, and to assure the success of the undertaking, though it was necessary to take account of the difficulty of hearing radio signals at a distance of 6,175 kilometers.

Operations began in October, 1913, and continued until early in March, 1914, with an interchange of observers near the middle. The astronomical observations were most satisfactory. It was not until after the middle of November that satisfactory exchanges of radio signals were effected.

Owing to the perfect installations of the clocks at Paris and Washington, which enabled their rates for many days to be determined with a precision at least equal to that of the observations, it was found possible to utilize the evenings on which radio signals were exchanged, when astronomical observations were made at one station only (incomplete), as well as those when such observations were made at both stations (complete).

In the first part of the operations, 7 complete and 14 incomplete evenings were secured and in the second part 10 complete and 20 incomplete evenings were secured. The results are as follows:

Complete Evenings

	h	m	s
First part	5	17	36.53
Second part	5	17	36.75
Weighted mean	5	17	36.65

For all Evenings

	h	m	s
First part	5	17	36.53
Second part	5	17	36.75
Weighted mean	5	17	36.67

The value $5^h\ 17^m\ 35^s.67$ is adopted as the definitive result of our work.

The difference $0^s.22$ between the results of the first and second parts should not be regarded as excessive in view of the peculiar conditions of the enterprise and of the difficulty of the exchange of radio signals. It does not seem capable of explanation without further labor.

In a preliminary publication of the results of the work of the American astronomers, the definitive result is given as $5^h\ 17^m\ 36^s.62$[2] which is within $0^s.01$ of our result, and there is a precisely similar difference between the two parts, $36^s.56$ and $36^s.76$, corresponding to $36^s.53$ and $36^s.75$ as given above.

[2] *Astronomical Journal*, March 15, 1915.